The Pixel Puzzle:

Why Video Game Characters Look Better Today??

Abstract

When you picture video games, you probably picture realistic figures, a lot of color, and a lot of detail, right? Those descriptions do not really describe video games from the early 1980's. So why do video games today look better than video games from the 80's? One major change between then and now is the number of pixels, or dots on the screen, used to represent video game objects. When Nintendo® first introduced the Super Mario Bros game for the Nintendo Entertainment System (NES) in 1985, Mario was no more than 16 pixels tall and 12 pixels wide. Today, the Mario in Super Paper Mario WiiTM has about four times as many pixels! Could the increase in pixels explain why Mario looks better on the Wii than he did on the NES? Put your artistic talent to use and discover the answer in this science fair project.

Objective

Determine if increasing the number of pixels makes a video game character look better.

Introduction

Have you ever seen an old computer, video, or arcade game and thought "Those characters look terrible! They're really blocky, and I can barely figure out what they're supposed to be!"? It's true that video game art has come a long way from what it looked like in the 1980's. By comparison, today's characters are much more detailed. But why? What has changed between then and now?

There have been many advances in the technology from the early days of video games to today's games, including the ability to store and display more data (information) on the screen. This means that the art in video games today can use more pixels than it did in the 1980's. Pixels are the smallest unit of data in a picture. If you were able to magnify your TV screen or computer monitor many times, you'd see that the entire screen is arranged with thousands of small dots or squares, like a piece of graph paper. Each dot or square is a pixel. To make a picture, each pixel is filled in with a single color, and many pixels are placed next to one another to form an image. Look at the example in Figure 1, below. When you look at the whole image you see a picture of a house. But if you zoom in on one area of the house, like in the boxed-in section, you can see that the picture is made up of individual squares of color—these are the pixels.

Video and Computer Games Science Project pixel house

Figure 1. This example shows an image of a house. The boxed-in area has been enlarged so that you can see the individual pixels.

The first home video game consoles, like the Nintendo® Entertainment System (NES), couldn't store or display much data, so only a few pixels could be shown on the screen at a time. Because of this, the video game characters and other video game art only used a few pixels. For example, Mario in the original Super Mario Bros. game had a resolution of 12x16, as in Figure 2. Resolution refers to the number of pixels wide (12 in the case of the NES Mario) and the number of pixels high (16 in the case of the NES Mario) an image is. But today's video game consoles can store much more data and the characters are higher resolution. For example, the Mario in Figure 2 from the Nintendo WiiTM game Super Paper Mario has a resolution of 50x67 (50 pixels wide and 67 pixels high).

Vide and computer Games Science Project Super Mario Brothers low and high resolution

Figure 2. On the left is the 1985 Mario from the original Super Mario Brothers game on the NES and on the right is the 2007 Mario from Super Paper Mario on the Nintendo Wii. The 2007 Mario is at a much higher resolution.

In addition to increasing the total number of pixels, modern video games also use smaller pixels. This means that more pixels can fit in the same amount of space. You can see this in Figure 2, where the two Marios are the same height, but the Wii Mario's height is made up of four times as many pixels. How does this combination of more and smaller pixels change the level of detail possible in today's video game art? You can discover the answer in this science fair project by making high- and low-resolution drawings of your own characters. Sharpen those pencils and get your drawing arm ready!

Terms, Concepts and Questions to Start Background Research

\* Technology

\* Data

\* Pixel

\* Resolution

Questions

\* What is a pixel?

\* The word pixel is a portmanteau (port-man-toh), which means a blend of sounds from two or more words. What are the words that are combined to mean pixel? (Hint: Split the word into the sounds "pix" and "el".)

\* What is the relationship between pixels and resolution?

\* Are video game characters today higher or lower resolutions than video game characters in the 1980's?

Materials and Equipment

\* Computer with internet access and a printer

\* Custom graph paper (six sheets); you should print graph paper for your project from Incompetech.com's free graph paper website

\* Pen or pencil

\* Ruler

\* Colored pencils, crayons, or markers

Experimental Procedure

In this experiment you'll draw the same character at two different resolutions: 32-by-32 pixels, and 8-by-8 pixels. In both cases, the size of the character will remain the same.

1. Using the computer, print out two sheets of graph paper for your project from Incompetech.com's free graph paper website.

1. For the first piece of graph paper, set the "Grid Spacing" to 2 lines per cm. This paper will be for your high-resolution (32-by-32 pixels) drawing. You can leave all the other settings as they are.

2. For the second piece of graph paper, set the "Grid Spacing" to 0.5 lines per cm. This paper has larger squares (pixels) and will be for your low-resolution (8-by-8 pixels) drawing. Again, you can leave all the other settings as they are.

2. Using a ruler and a pen or pencil, draw a box on the first piece of graph paper (the one with more squares) that is 32 pixels wide and 32 pixels high.

1. Each small square on the graph paper will represent a single pixel.

2. There will be a total of 1024 pixels within the box you drew.

3. This will be the space where you draw your high-resolution character.

3. With colored pencils, crayons, or markers, draw a character inside the 32-by-32 pixels box.

1. It can be any character you want. You can draw something from your own imagination, or try to copy an existing character.

2. Add as much detail as possible to your character.

3. Each pixel can only contain a single color.

4. The character does not have to take up all 1024 pixels; you can leave pixels blank if you want. For example, you may want to have blank pixels in between the legs of a character.

5. If you are going to color in a pixel, you must color the entire pixel. Remember, because pixels are the smallest measurable unit in an image, you cannot use only part of a pixel!

4. On the second piece of graph paper (the one with fewer squares) use a ruler and pen to draw a box that is 8 pixels wide and 8 pixels high.

1. There will be a total of 64 pixels in the box you drew.

2. This will be the space where you draw your low-resolution character.

5. Using the colored pencils, or other drawing tools, draw your character in the 8-by-8 pixels box.

1. Draw the same character as in step 3.

2. Try to keep as many of the details the same between the two resolutions.

6. Compare the high-resolution (32-by-32 pixels) drawing of the character with the low-resolution (8-by-8 pixels) drawing of the same character.

1. Which drawing has more detail?

2. Which drawing looks better?

7. Repeat steps 1-6 two more times using different characters, monsters, or objects. Are your results always the same?